

WHAT IS CLAIMED IS:

- 1 1. A field emission cathode comprising:
 - 2 a) a substrate; and
 - 3 b) a field emission cathode material comprising a mixture of carbon
 - 4 nanotubes and particles.
- 1 2. The cathode of claim 1, wherein the carbon nanotubes are selected from the
- 2 group consisting of single-wall carbon nanotubes, double-wall carbon nanotubes,
- 3 multi-wall carbon nanotubes, buckytubes, carbon fibrils, chemically-modified carbon
- 4 nanotubes, derivatized carbon nanotubes, metallic carbon nanotubes, semiconducting
- 5 carbon nanotubes, metallized carbon nanotubes, and combinations thereof.
- 1 3. The cathode of claim 1, wherein the particles are selected from the group
- 2 consisting of spherical particles, disk-shaped particles, lamellar particles, rod-like
- 3 particles, metal particles, semiconductor particles, polymeric particles, ceramic
- 4 particles, dielectric particles, clay particles, fibers, nanoparticles, and combinations
- 5 thereof.
- 1 4. The cathode of claim 1, wherein the cathode material resides on a surface of
- 2 the substrate as a layer.
- 1 5. The cathode of claim 4, wherein the layer of cathode material has a thickness
- 2 which ranges from about 10 nm to about 1 mm.
- 1 6. The cathode of claim 1, wherein nanotubes are present in the cathode material
- 2 in an amount which ranges from about 0.1 weight percent to about 99 weight percent.
- 1 7. The cathode of claim 1, wherein the carbon nanotubes are aligned.

1 8. The cathode of claim 1, wherein the carbon nanotubes have at least one end
2 trapped between particles.

3 9. The cathode of claim 1, wherein the carbon nanotubes are trapped within pores
4 in the particles.

1 10. The cathode of claim 1, wherein the carbon nanotubes are trapped within gaps
2 between the particles.

1 11. The cathode of claim 1, wherein the particles are lamellar.

1 12. The cathode of claim 11, wherein the CNTs are trapped between layers within
2 the particles.

1 13. A field emission display device comprising:

2 a) an anode assembly; and

3 b) a cathode assembly, wherein the cathode assembly comprises:

4 1) a substrate;

5 2) an electrically conducting layer deposited on the substrate; and

6 3) a field emission cathode material comprising carbon nanotubes

7 and particles deposited as a layer over the electrically conducting

8 layer.

1 14. A method comprising the steps of:

2 a) forming a mixture of carbon nanotubes and particles; and

3 b) depositing a layer of the mixture of carbon nanotubes and particles

4 onto a substrate to form a cathode.

1 15. The method of claim 14, wherein the nanotubes are selected from the group

2 consisting of single-wall carbon nanotubes, double-wall carbon nanotubes, multi-wall

3 carbon nanotubes, buckytubes, carbon fibrils, chemically-modified carbon nanotubes,

4 derivatized carbon nanotubes, metallic carbon nanotubes, semiconducting carbon

5 nanotubes, metallized carbon nanotubes, and combinations thereof.

1 16. The method of claim 14, wherein the particles are selected from the group

2 consisting of spherical particles, disk-shaped particles, lamellar particles, rod-like

3 particles, metal particles, semiconductor particles, polymeric particles, ceramic

4 particles, dielectric particles, clay particles, fibers, nanoparticles, and combinations

5 thereof.

1 17. The method of claim 14, wherein the step of forming a mixture of carbon

2 nanotubes and particles comprises a milling operation.

1 18. The method of claim 14, wherein the step of forming a mixture of carbon

2 nanotubes and particles comprises solvent dispersal.

1 19. The method of claim 14, wherein the mixture of carbon nanotubes and

2 particles is deposited using a method selected from the group consisting of spraying,

3 brushing, electrophoretic deposition, dipping, dispensing, screen printing, ink jet

4 printing, and combinations thereof.

1 20. The method of claim 19, further comprising a step to remove the solvent from

2 the mixture after depositing the mixture on the substrate.

1 21. The method of claim 14, further comprising a taping process to activate the
2 cathode.

1 22. The method of claim 14, further comprising a method of aligning the carbon
2 nanotubes within the layer of carbon nanotubes and particles.

1 23. The method of claim 14, wherein the particles are lamellar.

1 24. The method of Claim 23, further comprising a method of aligning the carbon
2 nanotubes using a shear force applied to the mixture of the carbon nanotubes and
3 lamellar particles.

1 25. The method of claim 23, wherein the lamellar particles comprise clay.